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ABSTRACT

Five abstracting and indexing services covering the field of political science were examined in order to ascertain if a causal relationship exists between how they are structured and how effective they are in producing citations on a given topic. Using the topics of communism, democracy, elections, and revolution, two hypotheses were formulated and tested. Hypothesis A postulated that the number of article citations for a given topic would rise in relation to an increase in the total number of journals covered by an abstracting and indexing publication. Hypothesis B postulated that the number of article citations for a given topic would rise in relation to an increase in the number of subject headings used for that topic. Data for each service during 1978 were tabulated. As a measure of correlation, a Pearson's r was calculated for each topic for both hypotheses. For hypothesis A none of the topics had a statistically significant level of correlation. The topics communism and revolution were found to be correlated after testing hypothesis B; that is, as the number of communism and revolution subject headings used by the services increased so the number of article citations increased. A 14-item bibliography concludes the report. (ESR)

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A BIBLIOMETRIC STUDY OF THE RELATIONSHIP OF NUMBER OF JOURNALS SCANNED AND NUMBER OF RELEVANT HEADINGS USED IN THE INDEX TO NUMBER OF CITATIONS RETRIEVED IN SEARCHES OF POLITICAL SCIENCE SECONDARY SERVICES

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This study examines five abstracting and indexing services covering the field of political science in order to ascertain if a causal relationship exists between how they are structured and how effective they are in producing citations for a given topic. The objective is to determine the degree of correlation associated with the number of journals covered, and the number of subject headings assigned to four topics by each service, to the number of citations that are listed for each topic by each service. The four topics are communism, democracy, elections and revolution. Two hypotheses are formulated and tested:

Hypothesis A-- The greater the number of journals covered by an abstracting and indexing publication the greater the number of article citations for a given topic.

Hypothesis B-- The greater the number of subject headings used for a given topic by an abstracting and indexing publication the greater the number of article citations for that topic.

Tabulated for each service during 1978 are the number of journals they list as being covered, the number of subject headings listed in the subject index for each topic, and the number of periodical article citations listed for each topic. As a measure of correlation a Pearson's r is calculated for each topic for both hypotheses. For hypothesis A none of the topics

had a statistically significant level of correlation. The topics communism and revolution were found to be correlated after testing hypothesis B; that is, as the number of subject headings used by the services increased so the number of article citations increased.

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As the information explosion continues to produce documents at an expanding rate researchers must increasingly rely on secondary information services. While these services act as intermediaries between users and primary literature, users are often ignorant as to the effectiveness of one particular service over another. This problem is compounded as more abstracting and indexing (A & I) services become available. Although these services often cover the same subject or subjects they may differ in their structure, such as the number of periodicals covered or type of indexing used.

A number of studies have been conducted which attempt to compare or evaluate A & I services. The most widely used method of inquiry has been to determine the duplication of coverage between A & I publications. Although the majority of these focus on the services which cover the literature of the hard sciences, an increasing amount of research is being directed toward the growing number of A & I publications in the social sciences. Perk examined the duplication of coverage between indexes in the education and psychology fields to prove "that a mutual interest in each other's discipline does exist."[1] The subject orientation of the individual titles indexed was determined through the use of periodical directories. The results show that periodicals were included from not only the education and psychology fields but also from such diverse areas as business, criminology, and

mathematics. This touches upon the interdisciplinary approach of the social sciences, and its implication for the literature search since the periodicals which an A & I service chooses to cover will determine the information the user will retrieve.

The investigation of Brittain and Roberts of overlap between services in the field of criminology led to criteria which A & I services could use to improve their publications.[2] Citation data were used in the construction of clusters of journals which could then be compared to the actual journal titles indexed by various services. The clusters represent "the way in which social scientists themselves group journals together" and therefore "secondary services should reflect these groupings in their coverage patterns."[3] It is implied that an A & I service can structure its publication to reflect the scope of a subject area as defined by the researchers in that particular field.

It is also possible to compare A & I services for their coverage of a specific topic. Smalley compared Psychological Abstracts and Index Medicus for their coverage of journal literature relating to operant conditioning.[4] All citations pertaining to the topic were counted from the issues of the two indexes covering the same time span. These citations were used to match those articles which were indexed by both services and to identify those articles which were unique to each service. It was found that there was "considerable overlap between the two tools in coverage of journal titles, but only 36% of the articles retrieved through use of the two

tools were identical matches."[5] Comparisons of this type indicate the necessity of consulting more than one service while performing a literature search to adequately identify all relevant articles.

Goehlert examined the state of journal coverage for the field of political science in a follow up study to a report published by the University of Chicago in 1950 which concluded that A & I coverage of the field was inadequate.[6] It was Goelhert's aim to judge the validity of this conclusion in view of the many newly established A & I services covering the literature of political science. The study consisted of checking various services for their coverage of 655 journals determined to be those most often used by political scientists. It was found that the "total journal sample was indexed an average of 4.5 times, more than double that of the Chicago study."[7] Goelhert concluded that while improvements have been made the abstracting system that now exists for the coverage of social science literature is still "fragmented and uncoordinated."[8] Users must still rely on a large number of services to satisfy their information needs.

The field of political science is particularly difficult to study because of its interdisciplinary nature. Palais examined the subject dispersion found in the indexing of political science journals and its impact on bibliographic control.[9] Data were borrowed from a citation analysis of political science literature conducted by June Stewart who ranked 179 journals according to the number of citations to them from various articles taken from a book of readings in comparative

politics.[10] Palais used the subject headings assigned by Ulrich's International Periodicals Directory for each of the journals in the Stewart study to measure the degree of subject dispersion in political science literature. Thirteen A & I services were then examined and ranked for their title coverage of each of the journals with the result that excellent coverage was given to the "25 most frequently cited journals" as determined by the Stewart study, but "no service covered more than 69 percent of the full list of 179 journals" and "twelve journals were not covered by any service."[11] Therefore a user could look at thirteen different services and still not be guaranteed total coverage of the journals cited in political science literature.

Palais then ranked ten of the services according to their actual indexing of 398 articles taken from the 25 journals cited above. Although two of the services covered all 25 of the journals and had the potential of indexing all 398 articles, these services "actually indexed only 234 and 176 articles respectively."[12] Upon compiling the actual citations generated by the services "some articles (seven) were not indexed at all, while others (seventeen) were indexed as many as eight times" proving that "even the most cited journals (i.e., the core literature) are in fact incompletely indexed."[13]

A major problem which occurs when working with A & I services, particularly those covering fields for which no controlled vocabulary exists such as political science, is in making use of the different subject headings which the

services have assigned to index the literature. In an article which outlines possible criteria for the evaluation of indexing services F.W. Lancaster writes:

> Coverage studies will show whether or not a particular item is contained in a printed index but will not tell us whether this item can be found in the index by a user consulting the most likely headings.[14]

In particular, Lancaster notes that "the policy regarding exhaustivity of indexing (i.e., the number of access points provided)" within an indexing publication will have an effect on the publication's performance.[15]

Martyn examined abstract journals in terms of their indexing by using their subject indexes to locate references to articles which were known to have been abstracted. His conclusion was that:

> The user of abstract indices should be gifted with a great deal of ingenuity or, as a substitute for this, a reasonably wide prior knowledge of his field so that all possible headings under which material may be discovered can be inspected.[16]

Unfortunately few studies of A & I services have included an investigation into their structure of indexing.

Previous studies of A & I services have focused on the content of their publications, in terms of subjects included or duplication of coverage between services. Publications covering the literature of political science are particularly difficult to study due to the interdisciplinary nature of the subject and the unstructured terminology of the literature. While it has been shown that coverage among these publications is uneven a user has no means of

determining which service may provide the most information relating to the topic of inquiry. Although a user can choose among a number of services which differ in regards to the periodicals they cover or the degree of subject indexing they provide, there is no way of determining the effectiveness of each service prior to an actual search.

The objective of this study is to compare various A & I services covering the field of political science to determine if any correlation exists between how a service is structured and how effective it is for a user interested in a particular topic. Several hypotheses are formulated and tested as a means of determining the degree of correlation. The results may indicate criteria a user could apply to an A & I service as a measure of its effectiveness before performing a search.

The methodology used in testing the hypotheses is based upon bibliometric and statistical techniques. The term "bibliometric" was popularized by Pritchard who used it to describe those "studies which seek to quantify the processes of written communication" through "the application of mathematical methods to books and other media of communication."[17] The decision to employ this particular research method is based upon the desire to design an investigation which would go beyond a mere description of the services under scrutiny to one capable of making comparisons based upon mathematical computations and not subjective observations.

Listed below are the A & I services selected to be

used in the collection of data. All are included in Herold's "State of the Art Survey of Political Science Reference Sources" published in 1978.[18] Although political science is an interdisciplinary field, aspects of which could be found covered in any of the social science reference sources, all of these publications specify political science as a major area of coverage. It would be fair to conclude that these sources are among those most frequently used by researchers in the field. The selected services, with the corresponding volumes used, are:

1. Advance Bibliography of Contents: Political Science and Government (Indexed Article Titles: A Guide to Periodical Literature) 10 (Santa Barbara, California: American Bibliographic Center, Clio Press, 1978).
2. International Political Science Abstracts (Documentation Politique Internationale) 28 (Paris: International Political Science Association, 1978).
3. Public Affairs Information Service Bulletin 64 (New York: Public Affairs Information Service, Inc., 1979).
4. Social Sciences Index 5 (New York: H.W. Wilson Comp., 1979).
5. United States Political Science Documents 4 (Pittsburgh: University Center for International Studies, University of Pittsburgh, 1978).

The volumes were chosen to represent the issues each service published through the base year of 1978. Annual cumulations were used due to their convenient grouping of relevant issues into one easy to handle volume. Also, it is hoped that any error in individual issues would have been corrected in the annual cumulation.

Two research hypotheses were constructed to reflect

the objective of the study; that is, each hypothesis contains the concepts of how an A & I publication is organized and how effective it is in relation to a particular topic.

Hypothesis A: The greater the number of journals covered by an A & I publication the greater the number of article citations for a given topic.

The rationale behind this hypothesis is that a user would expect to obtain more article citations to his topic from the A & I publication which covers the most periodicals.

Hypothesis B: The greater the number of subject headings used for a given topic by an A & I publication the greater the number of article citations for that topic.

Here, the reasoning is that a user will obtain more article citations to his topic if he has a large number of subject headings to look under. It should be noted that the term "citation" does not necessarily refer to separate articles since one article may be cited under several headings. The variables chosen to represent the differing structures of the A & I publications are therefore the number of periodicals covered, and the number of subject headings assigned to a given topic. Effectiveness is measured through the number of article citations generated by each publication for a given topic.

Four topics were chosen to be used in the collection of data-- communism, democracy, elections and revolution. All can be considered to be fundamental concepts studied by political scientists. They also meet the criterion of

being indexed in all five of the selected A & I publications.

The number of periodicals listed as being covered by each service during 1978 is shown in Table 1. This information was gathered from the list of periodicals each service provided within their respective publications. This study assumes that the widest possible coverage has been given to each periodical on the basis that the topics chosen are basic to the field of political science and are not peripheral topics which the services may or may not choose to include in their publications.

TABLE 1

NUMBER OF PERIODICALS COVERED IN SELECTED A & I PUBLICATIONS DURING 1978

Abstracting and Indexing Publication*	Number of Periodicals Covered
ABC	291
IPSA	727
PAIS	797
SSI	268
USPSD	118

* Key to Abstracting and Indexing Publications

ABC= Advance Bibliography of Contents: Political Science and Government

IPSA= International Political Science Abstracts

PAIS= Public Affairs Information Service Bulletin

SSI= Social Sciences Index

USPSD= United States Political Science Documents

For each A & I publication the number of periodical article citations listed during 1978 relating to each topic was tabulated (see Table 2). The method used in counting the

citations is as follows; first, using the subject index to the volumes, citations listed under the headings for each topic were counted, added to this were the citations listed under alphabetically adjacent root terms of each topic (i.e., the heading "Communist Bloc" would be considered as a root term for the topic "Communism"), and finally citations listed under "see" and "see also" references for those services which include them were added in to the resulting totals. Citations were included from only those "see also" references which were one level away from the original heading. For example, if the heading "Communism" had a "see also" reference to "Anarchism" those citations listed under "Anarchism" would be counted, however, any "see also" references from the heading "Anarchism would be disregarded. If this cut off point had not been established the continual use of the "see also" would lead to headings increasingly removed from the original topic. One exception to the procedure above is a result of the United States Political Science Documents use of a "Rotated Subject Descriptor Display" in place of "see" and "see also" references. In this case citations were added in from those headings which the descriptor display showed to be rotated around the original topic and its alphabetically adjacent root terms. The goal of this method was to obtain all relevant citations to each of the topics taking into consideration that each publication would have different subject headings and that citations would be posted to them by individual indexer discretion.

TABLE 2

NUMBER OF PERIODICAL CITATIONS COUNTED FROM SELECTED A & I PUBLICATIONS COVERING THE TOPICS "COMMUNISM", "DEMOCRACY", "ELECTIONS" AND "REVOLUTION" DURING 1978

Abstracting and Indexing Publication	Citations Counted			
	Communism	Democracy	Elections	Revolution
ABC	66	30	101	32
IPSA	207	73	309	31
PAIS	158	30	130	4
SSI	553	167	482	316
USPSD	176	100	149	86

It had been hoped that the number of citations to monographs relating to each of the topics could be counted so as to compare the ratio of periodical to monograph citations between the chosen services. However only one of the services (PAIS) included coverage of monographic material.

In order to determine the validity of hypothesis A the "Pearson product moment correlation coefficient" (r) was calculated using data from the tables above.[19] This is a statistical test used to determine the degree of association between two variables, each of which must be measured on an interval scale from populations which are assumed to be normally distributed. A test of significance can be made of the r value to indicate the acceptance or rejection of the null hypothesis (statistical procedures require the negation of the original hypothesis to reduce the probability of error during testing). Since the hypothesis indicates a positive correlation exists between variables the null

hypothesis is that a negative correlation exists between the number of journals covered by an A & I publication and the number of article citations found for a given topic.

The five selected A & I services comprise the sample size (N=5). Because N is less than thirty the chosen level of significance is .05 (alpha=.05). This number represents the region of rejection which requires that if "any observed outcome . . . falls into its range . . . the null hypothesis must be rejected."[20] Specifically,

> If alpha= .05 this means that if an observed outcome is among the 95% more likely possibilities, the null hypothesis is <u>not</u> rejected. But if it falls into the least likely 5%, we reject the null hypothesis.[21]

It has been found that when using small sample sizes a greater region of rejection will minimize the probability of "failing to reject a false null hypothesis."[22]

To calculate the correlation coefficient for each of the four topics the data in table 2 was broken down into the individual topics and the necessary computations to complete the formulation for r were made (see Table 3a-d). The formula for Pearson's r is:

$$r = \frac{nExy-(Ex)(Ey)}{\sqrt{[nEx^2-(Ex)^2][nEy^2-(Ey)^2]}} \quad 23$$

where n= sample size
E= sum of
x= first variable
y= second variable

TABLE 3A-D

NUMBER OF PERIODICALS COVERED AND NUMBER OF PERIODICAL CITATIONS COUNTED FROM SELECTED A & I PUBLICATIONS COVERING THE TOPICS "COMMUNISM", "DEMOCRACY", "ELECTIONS" AND "REVOLUTION" DURING 1978 INCLUDING CALCULATIONS FOR PEARSON'S R

3A COMMUNISM

A & I Publication	x Periodicals Covered	x^2	y Citations	y^2	xy	
ABC	291	84681	66	4356	19206	Ex= 2201
IPSA	727	528529	207	42849	150489	Ex^2= 1334167
PAIS	797	635209	158	24964	125926	Ey= 1160
SSI	268	71824	553	305809	148204	Ey^2= 408954
USPSD	118	13924	176	30976	20768	Exy= 464593
						r= -.204

3B DEMOCRACY

A & I Publication	x Periodicals Covered	x^2	y Citations	y^2	xy	
ABC	291	84681	30	900	8730	Ex= 2201
IPSA	727	528529	73	5329	53071	Ex^2= 1334167
PAIS	797	635209	30	900	23910	Ey= 400
SSI	268	71824	167	27889	44756	Ey^2= 45018
USPSD	118	13924	100	10000	11800	Exy= 142267
						r= -.490

TABLE 3A-D-- Continued

3C ELECTIONS

A & I Publication	x Periodicals Covered	x^2	y Citations	y^2	xy
ABC	291	84681	101	10201	29391
IPSA	727	528529	309	95481	224643
PAIS	797	635209	130	16900	103610
SSI	268	71824	482	232324	129176
USPSD	118	13924	149	22201	17582

Ex= 2201
Ex^2= 1334167
Ey= 1171
Ey^2= 377107
Exy= 504402
r= -.057

3D REVOLUTION

A & I Publication	x Periodicals Covered	x^2	y Citations	y^2	xy
ABC	291	84681	32	1024	9312
IPSA	727	528529	31	961	22537
PAIS	797	635209	4	16	3188
SSI	268	71824	316	99856	84688
USPSD	118	13924	86	7396	10148

Ex= 2201
Ex^2= 1334167
Ey= 469
Ey^2= 109253
Exy= 129873
r= -.496

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Statistical tables list the significant value of r for a one-tailed test at three degrees of freedom (sample size minus two) with a significance level of .05 as .805.[24] The number of degrees of freedom is an allowance for error when calculating r from a given sample size. The test is one-tailed because the research hypothesis specifies a direction of association, that is, as the number of journals covered by an A & I publication increases the number of article citations for a given topic will increase. Therefore, if the calculated r values are greater than or equal to .805 the null hypothesis will be rejected.

The calculated r values for the four topics can be summarized as follows:

Topic	r-value
Communism	-.204
Democracy	-.490
Elections	-.057
Revolution	-.496

Since none of the r values are equal to or greater than .805 the null hypothesis cannot be rejected. The fact that the r values are negative when a positive association was implied in the research hypothesis is not significant because the values of r were small. From the test data it cannot be concluded that the greater number of periodicals covered by an A & I publication will lead to a greater number of article citations for the specified topics.

Periodical coverage and the generation of article citations can then be considered as independent populations. A user would not be able to determine which A & I publication

would give him the most citations based upon the number of periodicals it lists as being covered. This indicates that the editorial policy of a publication may be a primary factor in determining the number of citations listed for a topic. This makes the user dependent on the decisions made by the individual services as to the number of citations that can be found.

For testing hypothesis B the number of subject headings assigned to each topic by the chosen A & I services were counted in the following manner. First, each heading along with the headings which included alphabetically adjacent root terms of each topic were counted, then the "see" and "see also" headings (only those one level removed from the original heading) were added in (Table 4). For the United States Political Science Documents publication the headings found in the "Rotated Subject Descriptor Display" were substituted for the "see" and "see also" headings. Subheadings were not included since they represent divisions of a subject heading already counted and do not necessarily relate to subject content (i.e., geographic or form headings). The goal was to obtain all relevant subject headings used by each service to index each topic.

The other variable contained in hypothesis B is the number of article citations found in each publication for each topic (Table 2).

TABLE 4

NUMBER OF SUBJECT HEADINGS COUNTED FROM SELECTED A & I PUBLICATIONS COVERING THE TOPICS "COMMUNISM", "DEMOCRACY", "ELECTIONS" AND "REVOLUTION" DURING 1978

Abstracting and Indexing Publication	Subject Headings Counted			
	Communism	Democracy	Elections	Revolution
ABC	1	1	2	1
IPSA	23	26	38	4
PAIS	50	3	16	4
SSI	113	17	32	36
USPSD	12	29	38	19

The null hypothesis which is actually being tested for is that a negative correlation exists between the number of subject headings used for a given topic and the number of article citations for that topic. The Pearson's r for each topic was then calculated following the procedure used for hypothesis A with the same significance level of .05. The calculations for r for each topic are given in Table five.

The significant value of r is again .805 since this is a one-tailed test at three degrees of freedom with a significance level of .05. If the calculated r values, summarized below, are greater than or equal to .805 the null hypothesis will be rejected.

Topic	r-value
Communism	.930
Democracy	.572
Elections	.553
Revolution	.952

The results show that a positive correlation exists for two of the topics, "communism" and "revolution". It can

TABLE 5A-D

NUMBER OF SUBJECT HEADINGS USED AND NUMBER OF PERIODICAL CITATIONS COUNTED FROM SELECTED A & I PUBLICATIONS COVERING THE TOPICS "COMMUNISM", "DEMOCRACY", "ELECTIONS" AND "REVOLUTION" DURING 1978 INCLUDING CALCULATIONS FOR PEARSON'S R

5A COMMUNISM

A & I Publication	x Subject Headings	x^2	y Citations	y^2	xy
ABC	1	1	66	4356	66
IPSA	23	529	207	42849	4761
PAIS	50	2500	158	24964	7900
SSI	113	12769	553	305809	62489
USPSD	12	144	176	30976	2122

$Ex = 199$
$Ex^2 = 15943$
$Ey = 1160$
$Ey^2 = 408954$
$Exy = 77328$
$r = .930$

5B DEMOCRACY

A & I Publication	x Subject Headings	x^2	y Citations	y^2	xy
ABC	1	1	30	900	30
IPSA	26	676	73	5329	1898
PAIS	3	9	30	900	90
SSI	17	289	167	27889	2839
USPSD	29	841	100	10000	2900

$Ex = 76$
$Ex^2 = 1816$
$Ey = 400$
$Ey^2 = 45018$
$Exy = 7757$
$r = .572$

TABLE 5A-D-- Continued

5C ELECTIONS

A & I Publication	x Subject Headings	x^2	y Citations	y^2	xy
ABC	2	4	101	10201	202
IPSA	38	1444	309	95481	11742
PAIS	16	256	130	16900	2080
SSI	32	1024	482	232324	15424
USPSD	38	1444	149	22201	5662

Ex= 126
Ex^2= 4172
Ey= 1171
Ey^2= 377107
Exy= 35110
r= .553

5D REVOLUTION

A & I Publication	x Subject Headings	x^2	y Citations	y^2	xy
ABC	1	1	32	1024	32
IPSA	4	16	31	961	124
PAIS	4	16	4	16	16
SSI	36	1296	316	99856	11376
USPSD	19	361	86	7396	1634

Ex= 64
Ex^2= 1690
Ey= 469
Ey^2= 109253
Exy= 13182
r= .952

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be concluded that for these two topics the number of citations counted for each is associated with the corresponding number of subject headings. As the number of subject headings increased the number of citations increased. However, this was not the case for the topics "democracy" and "elections" for which the null hypothesis cannot be rejected. A possible reason for this may be within the selected topics themselves. The term "revolution" may have fewer synonymous or related meanings from which subject headings can be constructed as opposed to the broad philosophical principle of "democracy". Three of the selected publications had fewer than five subject headings for the topic "revolution".

Testing of hypothesis A has shown that for those topics selected the number of periodicals a service covers has no relation to the number of citations corresponding to that topic found within the service. A user would not find a list of periodicals covered helpful as a measure of the effectiveness of a service. This indirectly supports the conclusions reached in previous studies which advise that a researcher must use more than one reference service to obtain all relevant citations to a topic. The statistical significance of hypothesis B gives evidence to Lancaster's conclusion that the exhaustivity of indexing used within a publication will affect the performance of that publication since a greater number of subject headings led to a greater number of citations for two of the topics selected.[25] Overall it is difficult to judge how effective a service will be for a user based upon how it is structured. As Martyn writes in regard to the problems faced

by a user performing a literature search-- "The first problem is the choice of service to search, which is largely a matter of trial and error."[26] Further research in evaluating and measuring A & I services may lessen this problem. Computerized data collection would make it possible to measure for correlation in a large number of topics from many A & I publications as opposed to the limited number of topics studied in this report. This method would generate data of much higher statistical significance than is indicated here. The small sample size of this study causes a greater margin for error than would be found in a study conducted on a larger scale. This type of research can be done more speedily and with greater accuracy through the application of automated procedures.

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